SUPPORTING INFORMATION

How much will it cost to monitor microbial drinking water quality in sub-Saharan Africa?

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1. Estimated cost per test for physico-chemical parameters

We estimated the price of pH and turbidity field meters to be 267 USD and 1,090 USD, respectively (prices listed by a US manufacturer).[1] Assuming a lifetime of 5 years and 1 test per day, equipment costs for pH and turbidity monitoring amount to 0.7 USD per test. Murray and Lantagne compared 7 commercial chlorine test kits and concluded that the LaMotte colorimeter and test tube kits were the most appropriate in low-resource regions, costing 0.1-0.5 USD per test in equipment and consumables;[2] we used 0.5 USD as the estimated cost per chlorine test. Overall, the equipment and consumables costs of physico-chemical testing amount to approximately 1.2 USD per test.

2. Number and size of piped water systems: analysis in 8 countries

We estimated the number and size of piped water systems in Guinea, Kenya, Mauritius, Mozambique, South Africa, Tanzania, Uganda, and Zambia, using data from national suppliers, regulators, or ministries.

2.1 Guinea

We used two sources of data:

- A list of the 31 piped water systems operated by the national water supplier (Société des Eaux de Guinée, SEG) in urban areas, provided by Aquaya's contact at SEG (2013). This list indicated the population served by each system according to SEG.
- A list of 101 small piped water systems operated by Service d'Aménagement des Points d'Eau (SNAPE) in rural areas, provided by Aquaya's contact at SNAPE (2014). This list indicated the population served only for 32 systems. Therefore we applied the average population served among these 32 systems (3,599, with a standard deviation of 1,834) to the remaining 69 systems.

The resulting estimate of the population served by piped water in Guinea was 4,252,781, which was significantly higher than JMP's estimate (2,242,217, see section 2.2 of the manuscript, and Table S2). Nevertheless, we used Guinea's water suppliers' estimates in our subsequent cost calculations, because local monitoring requirements are more likely to be based on their estimates of population served than on JMP data.

2.2 Kenya

We used two sources of data:

- A list of 91 piped water systems provided in the latest annual report (2013-2014) by the national regulator (WASREB).[3] This list indicated the population served by each system, amounting to a total of 10,496,105, which was lower than JMP's estimate of the population served by piped water in Kenya (16,126,525, see Table S2).
- A 2012 report by the International Finance Corporation (World Bank),[4] which estimated the total number of piped water systems in Kenya to be 1,297, with the vast majority being very small (serving less than 1,000 households).

We assumed that the unregulated systems had a service coverage of 42%, which is the average coverage of the smallest systems in the WASREB report.

We then estimated that 1,039 of the 1,206 unregulated systems served less than 5,000 people. This estimate corresponds to the number of towns (in the 2009 Census) with access to piped water and with populations smaller than 11,944 (=5,000/0.42). The resulting estimate for the total population served by these systems was 3,167,657.

Similarly, we estimated that the remaining 167 unregulated systems served less than 10,000 people. The total population served by these systems was assumed to be 2,472,129, the remainder to reach the JMP's estimate of population using piped water in Kenya.

2.3 Mauritius

We used a list of the 6 piped water systems operated by the national supplier (Central Water Authority, CWA),[5] provided in the latest annual report (2014). This list indicated the number of connections for each system. To calculate the population served by each system, we assumed a fixed number of people per connection, 3.59, corresponding to the total population served according to JMP (1,248,383, see Table S2) divided by the total number of connections according to CWA (347,397).

2.4 Mozambique

We used a list of 145 piped water systems provided in the latest retrospective report (2009-2014) by the national regulator (CRA).[6] This list indicated the population served only for the 16 largest systems. To estimate the population served by the remaining 139 systems, we estimated the 2014 population in each of the corresponding towns (using 2007 Census data and applying the same growth rate as between 1997 and 2007) and multiplied it by the service coverage of the smallest system for which information was available in the CRA report.

The resulting population served amounted to 7,265,911, which was slightly lower than JMP's estimate (7,438,753, see Table S2). We therefore assumed that a number of small and unregulated piped water systems operate in Mozambique. Because we could not find detailed census data with both access to piped water and town population size, we assumed 35 such systems serving 5,000 people each. This assumption was consistent with our analysis for Kenya.

2.5 South Africa

We used two sources of data:

- A list of 925 piped water systems provided in the second-to-last annual report (2012) by the national regulator (Blue Drop).[7] This list indicated the population served by each system according to Blue Drop.
- The latest annual report by Blue Drop (2014), indicating that 1,036 had been assessed. However, the 2014 report did not list these systems nor indicated their population served.

We assumed the 111 systems that became regulated between 2012 and 2014 to be all small (<5,000), and applied the average size of small systems in the 2012 Blue Drop report (1,996).

The resulting population served amounted to 47,545,546, which was higher than JMP's estimate (46,025,128, see Table S2). Nevertheless, we used South Africa's water regulator's estimates in our subsequent cost calculations, because local monitoring requirements are more likely to be based on his estimates of population served than on JMP data.

2.6 Tanzania

We used a list of 130 piped water systems provided in the latest annual regional and district reports (2014-2015) by the national regulator (EWURA).[8] This list indicated the population served by each system, except for 15 district systems, to which we applied the average population served among the other 83 district systems in the EWURA report.

The resulting population served amounted to 9,031,281, which was lower than JMP's estimate (13,379,723, see Table S2). We therefore assumed that a number of small and unregulated piped water systems operate in Tanzania. Because we could not find detailed census data with both access to piped water and town population size, we assumed 807 such systems serving 5,000 people each. This assumption was consistent with our analysis for Kenya and Mozambique.

2.7 Uganda

We used a list of 1,009 functional piped water systems provided in the Water Supply Atlas (2014-2015) by the Ministry of Water and Environment.[9] This list indicated the population served by 607 systems. We assumed the remaining 402 systems to be small, half serving 5,000 people and half serving 10,000 people.

The resulting population served amounted to 6,757,448, which was lower than JMP's estimate (8,271,443, see Table S2). We therefore assumed that a number of small and unregulated piped water systems operate in Uganda. Because we could not find detailed census data with both access to piped water and town population size, we assumed 303 such systems serving 5,000 people each. This assumption was consistent with our analysis for Kenya, Mozambique, and Tanzania.

2.8 Zambia

We used a list of the 17 piped water systems operated by the national supplier (NWASCO),[10] provided in the latest annual report (2015). This list indicated the population served by each system according to NWASCO.

The resulting estimate of the population served by piped water in Zambia was 5,232,697, which was higher than JMP's estimate (4,985,355, see Table S2). Nevertheless, we used Zambia's water suppliers' estimates in our subsequent cost calculations, because local monitoring requirements are more likely to be based on their estimates of population served than on JMP data.

3. Estimated upfront costs of water quality monitoring programs

As mentioned in section 4.1, we estimated that the upfront costs related to laboratory equipment, staff training, and water mapping amount to 0.06, 0.02, and 0.14 USD per person served, respectively. Using population data from Table S2, we estimated the total upfront costs for each country as follows:

$$Upfront\ costs = (0.06 + 0.02) * Population_{Improved\ sources} + 0.14 * Population_{Improved\ point\ sources}$$

For the 16 countries who provided their annual WASH budgets in the UN Water 2014 GLAAS report,[11] we compared these budgets with the estimated upfront costs of monitoring.

4. Supporting tables

Table S1: Characteristics of the 18 institutions who participated in the Monitoring for Safe Water (MfSW) research program and provided information about testing costs.

Institution	Type [a]	Country	Rural /urban	Catchment area (km^2)	Population served	Testing method [b]	Testing typology [c]
E1	supplier	Ethiopia	Urban	179	130,000	MF	A
E2	supplier	Ethiopia	Urban	1,265	410,000	MF	A
E3	surv.	Ethiopia	Rural	124,824	10,560,058	MF	A
E4	surv.	Ethiopia	Rural	276,227	20,000,000	MPN	B
G1	supplier	Guinea	Urban	34,036	686,221	MF	C
K1	supplier	Kenya	Urban	403	400,000	MPN	A
K2	supplier	Kenya	Urban	49	261,438	Petr./Colilert	A
K3	supplier	Kenya	Urban	1,533	90,000	MPN	A
K4	surv.	Kenya	Rural	82	174,450	H2S	C
S1	surv.	Senegal	Both	22,709	4,985,467	MF	D
U1	supplier	Uganda	Urban	1,496	570,705	MF	C
U2	surv.	Uganda	Rural	7,408	776,000	MF	A
U3	surv.	Uganda	Rural	2,887	239,878	MF	A
U4	surv.	Uganda	Rural	15,846	478,192	MF	D
U5	surv.	Uganda	Rural	2,006	3,133,638	MF	A
Z1	supplier	Zambia	Urban	264,769	94,714	MF	C
Z2	surv.	Zambia	Rural	11,011	75,343	MF	B
Z3	surv.	Zambia	Urban	960	2,011,957	MF	A

[a] supplier= piped water supplier, surv. = health surveillance agency. [b] Microbial testing methods were membrane filtration (MF), most probable number (MPN), presence/absence H_2S (H_2S), and Petrifilm™-Colilert®[12,13] (presence/absence in 10 mL) (Petr./Colilert). [c] Four testing typologies have been described in Kumpel et al., 2015.[14] A: one testing location, same staff sampling and testing. B: one testing location, different staff sampling and testing. C: several testing locations with 1-2 staff doing both sampling and testing. D: several testing locations with many different staff doing both sampling and testing.

Table S2: Estimates of the population using piped water and improved point sources in 46 countries in sub-Saharan Africa. Columns 3-8 were obtained from the most recent survey included in the WHO/UNICEF JMP country files (year specified in column 2);[15] the remaining columns were calculated using the first six and UN Population Division estimates from 2015.[15]

	Country population (thousands)	Date of JMP data	Piped on premises (%)		Public taps (%)		Improved point sources (%)		Pop. using piped water	Pop. using imp. point sources	% Rural	% Piped water coverage
			Urban	Rural	Urban	Rural	Urban	Rural				
Angola	22,820	2011	32.8	0.5	29.2	9.6	11.9	22.9	7,518,711	4,121,966	55.9	32.9
Benin	10,880	2012	33.2	5.0	26.6	29.9	25.0	37.0	4,987,308	3,450,954	56.0	45.8
Botswana	2,056	2010	89.3	44.2	9.7	30.6	0.0	12.1	1,824,031	105,888	42.6	88.7
Burkina Faso	17,915	2010	32.6	0.0	45.4	4.7	16.3	66.5	4,762,849	9,227,997	70.1	26.6
Burundi	10,813	2012	53.0	0.6	27.5	22.3	5.2	53.5	3,222,688	5,158,891	87.9	29.8
Cameroon	23,393	2011	25.7	2.4	39.5	11.8	23.7	35.4	9,816,764	6,785,626	45.6	42.0
Cape Verde	508	2012	58.9	47.0	19.8	20.8	0.2	5.6	380,943	10,479	34.5	74.9
Central Afr. Rep.	4,803	2010	3.4	0.0	43.2	0.4	35.2	54.3	907,639	2,240,780	60.0	18.9
Chad	13,606	2010	28.2	1.0	23.3	9.6	20.9	31.3	2,701,250	3,940,559	77.5	19.9
Comoros	770	2012	58.0	28.3	24.9	19.4	11.9	36.0	444,279	224,702	71.7	57.7
Congo	4,671	2012	39.3	2.6	39.8	5.2	13.8	33.9	2,541,837	969,667	34.6	54.4
Côte d'Ivoire	21,295	2012	62.9	7.0	10.4	20.2	21.0	24.2	11,111,278	4,782,504	45.8	52.2
DRC	71,246	2014	19.8	0.5	16.3	7.2	18.9	39.8	14,110,786	22,028,476	57.5	19.8
Equatorial Guinea	799	2011	12.5	7.4	31.2	11.9	2.4	13.6	232,147	72,972	60.1	29.0
Eritrea	6,738	2010	38.9	0.4	18.6	35.6	8.4	27.2	2,753,464	1,545,901	77.4	40.9
Ethiopia	98,942	2014	51.0	0.7	32.3	16.9	1.7	23.1	30,071,504	18,700,891	80.5	30.4
Gabon	1,751	2012	72.0	13.7	23.0	15.4	5.0	34.9	1,515,789	154,812	12.8	86.6
Gambia	1,970	2010	46.7	2.9	29.6	39.4	13.7	51.9	1,232,774	573,701	40.4	62.6
Ghana	26,984	2013	28.4	2.5	13.7	11.0	23.6	61.8	7,821,599	11,105,696	46.0	29.0
Guinea	12,348	2012	40.9	0.4	3.4	2.3	47.1	46.8	2,242,217	5,791,487	62.8	18.2
Guinea-Bissau	1,788	2010	8.8	0.4	13.9	4.8	26.7	13.5	247,707	357,771	50.7	13.9
Kenya	46,749	2012	51.1	16.1	18.8	6.2	14.5	28.5	16,126,525	11,646,419	74.4	34.5
Lesotho	2,120	2012	63.7	4.1	8.4	51.9	7.1	23.2	1,280,491	398,641	72.7	60.4
Liberia	4,503	2013	1.9	0.0	3.0	0.0	76.0	56.6	111,510	2,984,534	50.3	2.5
Madagascar	24,235	2013	20.5	2.2	51.2	10.3	15.9	16.8	8,065,999	3,994,976	64.9	33.3
Malawi	17,309	2014	37.7	2.4	39.5	6.0	9.8	75.2	3,391,638	11,174,181	83.7	19.6
Mali	16,259	2014	29.0	2.0	40.2	12.2	16.7	54.6	5,878,129	6,417,541	60.1	36.2
Mauritania	4,080	2011	39.1	24.4	12.2	5.0	1.5	19.9	1,734,468	362,566	40.1	42.5
Mauritius	1,254	2011	99.8	99.3	0.1	0.1	0.0	0.0	1,248,383	0	60.3	99.6
Mozambique	27,122	2011	36.0	1.3	19.2	12.9	12.5	22.4	7,438,753	5,208,813	67.8	27.4
Namibia	2,392	2013	70.4	31.0	26.3	22.8	0.4	18.0	1,765,979	234,161	53.3	73.8
Niger	19,268	2012	41.3	1.2	52.8	18.7	2.8	40.7	6,508,777	6,466,895	81.3	33.8
Nigeria	183,523	2013	6.1	0.8	9.6	4.7	60.2	42.1	19,085,591	93,116,503	52.2	10.4
Rwanda	12,428	2013	43.1	1.7	30.1	24.8	23.9	50.1	4,964,083	5,284,480	71.2	39.9
Senegal	14,967	2014	76.1	45.8	10.5	17.7	3.2	7.8	11,015,982	866,439	56.3	73.6
Sierra Leone	6,319	2013	10.6	0.3	33.9	7.6	39.1	38.6	1,422,872	2,451,589	60.1	22.5
Somalia	11,123	2005	38.8	0.3	14.1	4.2	5.4	6.9	2,629,693	701,480	60.4	23.6
South Africa	53,491	2013	90.4	36.9	6.8	28.7	0.7	8.0	46,025,128	1,744,175	35.2	86.0
South Sudan	12,152	2010	6.1	0.8	10.4	5.8	51.5	53.6	1,028,285	6,465,655	81.2	8.5
Sudan	39,613	2010	59.5	20.8	2.0	2.9	5.0	32.9	14,450,097	9,290,847	66.2	36.5
Swaziland	1,286	2010	75.0	25.3	4.5	19.3	3.3	13.6	668,937	146,618	78.7	52.0
Togo	7,171	2014	12.3	0.4	36.8	10.8	12.2	13.3	1,889,896	921,907	60.0	26.4
Uganda	40,141	2012	16.8	1.6	35.1	13.0	10.6	22.5	8,271,443	8,262,649	83.9	20.6
Tanzania	52,291	2013	27.1	4.9	8.4	16.1	39.0	63.6	13,379,723	29,191,020	68.4	25.6
Zambia	15,520	2014	41.4	1.6	31.9	2.0	15.2	43.3	4,985,355	4,935,357	59.1	32.1
Zimbabwe	15,046	2014	66.4	3.7	2.5	4.4	27.6	59.0	4,180,456	7,347,627	67.6	27.8
TOTAL (46)	**986,459**		**34.7**	**5.2**	**18.0**	**11.4**	**26.2**	**36.4**	**297,995,756**	**320,966,794**	**62.4**	**30.2**

Table S3: WHO microbial water quality monitoring guidelines, from Drinking Water Guidelines, 4th edition[16]

	Population served	Recommended number of microbial water quality tests
Piped supplies	< 5,000	12
	> 5,000 and < 100,000	12 per 5,000 people
	> 100,000 and < 500,000	12 per 10,000 people + 120
	> 500,000	12 per 50,000 people + 600
Point sources	-	Once every 3-5 years

Table S4: Goodness-of-fit for 4 different models used to predict the annual number of tests per capita for piped supplies. We hypothesized that two factors might influence the outcome: the percentage of the population living in rural areas (% Rural) and the proportion of the population served with piped water (% Coverage). We tested models with 1 or 2 of these variables, with and without an interaction term. The best model (with the highest R^2 value) is highlighted in bold.

Variables included in model		Goodness-of-fit (R^2)
% Rural		0.475
% Coverage		0.088
% Rural, % Coverage	Without interaction	0.515
	With interaction	**0.902**

Table S5: Cost of one microbial water quality test for 18 MfSW partner institutions, in USD, broken down into equipment, consumables, labor, and logistics. The currency exchange rate of 1/1/2015 was used. Institutions have been anonymized, but the countries (Ethiopia, Guinea, Kenya, Senegal, Uganda, and Zambia) are represented by their first letter. The majority of institutions used membrane filtration (exceptions: [a] Most probable number, [b] Petrifilm™-Colilert®[12,13], [c] H_2S).

		Equipment	Consumables	Labor	Logistics	Total
Suppliers (n=8)	E1	13.6	7.8	2.0	2.2	**25.7**
	E2	4.1	2.3	0.5	9.5	**16.2**
	G1	3.7	4.1	5.6	4.1	**17.5**
	K1[a]	0.9	8.8	0.6	7.5	**17.9**
	K2[b]	5.8	5.0	1.9	6.6	**19.3**
	K3[a]	5.3	2.0	20.5	1.6	**29.4**
	U1	4.8	4.2	1.7	3.4	**14.1**
	Z1	10.9	1.8	0.8	7.9	**21.4**
	Average	6.1	4.5	4.2	5.3	**20.2**
	St. dev.	4.1	2.6	6.8	2.9	**5.1**
Surveillance agencies (n=10)	E3	3.0	3.0	4.0	41.9	**51.9**
	E4[a]	1.1	2.1	0.5	18.1	**21.7**
	K4[c]	1.1	5.5	1.7	5.8	**14.1**
	S1	2.2	1.6	4.9	13.8	**22.4**
	U2	0.9	1.3	0.2	4.2	**6.6**
	U3	1.8	4.2	9.1	12.0	**27.0**
	U4	1.4	1.2	1.6	3.3	**7.4**
	U5	0.6	2.7	1.7	1.8	**6.7**
	Z2	3.7	4.1	8.3	3.9	**20.0**
	Z3	5.5	2.0	25.7	6.0	**39.2**
	Average	2.1	2.8	5.8	11.1	**21.7**
	St. dev.	1.5	1.4	7.7	12.0	**14.8**
Average all institutions		3.9	3.5	5.1	8.5	**21.0**
St. dev. all institutions		3.5	2.2	7.1	9.4	**11.3**

Table S6: Estimated annual costs of microbial water quality monitoring (based on WHO guidelines) for piped supplies and improved point sources in all sub-Saharan countries, in USD. For piped supplies, we used the number of tests per capita predicted by the model in Equation 1. For point sources, we used a uniform number of users per source, corresponding to the average across the 10 countries in Table 2 (330). We also present a sensitivity analysis, performed as follows. For piped supplies, we applied to all countries the 5th or 95th percentile of the numbers of tests per capita across the 8 countries in Table 1 (1.33 and 2.59 tests/1,000 people, respectively). For point sources, we applied to all countries the 5th or 95th percentile of the numbers of users per source across the 10 countries in Table 2 (110 and 489, respectively).

Country	Estimated annual costs of monitoring piped water supplies (USD)			Estimated annual costs of monitoring improved point sources (USD)		
	Estimate	Lower bound	Upper bound	Estimate	Lower bound	Upper bound
Angola	200,971	210,751	409,481	65,577	44,295	197,089
Benin	144,105	139,795	271,617	54,902	37,084	165,005
Botswana	65,872	51,128	99,340	1,685	1,138	5,063
Burkina Faso	201,363	133,504	259,392	146,809	99,165	441,229
Burundi	198,551	90,333	175,513	82,073	55,438	246,668
Cameroon	188,266	275,166	534,636	107,953	72,919	324,449
Cape Verde	10,827	10,678	20,747	167	113	501
Central Afr. Rep.	26,993	25,441	49,431	35,649	24,080	107,141
Chad	142,124	75,717	147,114	62,691	42,346	188,415
Comoros	17,639	12,453	24,196	3,575	2,415	10,744
Congo	42,477	71,248	138,432	15,427	10,420	46,364
Côte d'Ivoire	255,514	311,451	605,138	76,085	51,393	228,672
DRC	375,701	395,528	768,496	350,453	236,720	1,053,274
Equatorial Guinea	7,133	6,507	12,643	1,161	784	3,489
Eritrea	129,791	77,180	149,958	24,594	16,612	73,916
Ethiopia	1,600,561	842,910	1,637,741	297,514	200,961	894,168
Gabon	52,753	42,488	82,552	2,463	1,664	7,402
Gambia	29,726	34,555	67,139	9,127	6,165	27,431
Ghana	116,382	219,241	425,977	176,682	119,343	531,010
Guinea	142,480	119,206	231,613	92,137	62,236	276,915
Guinea-Bissau	4,007	6,943	13,491	5,692	3,845	17,107
Kenya	736,979	452,029	878,276	185,284	125,153	556,864
Lesotho	50,999	35,892	69,738	6,342	4,284	19,061
Liberia	1,403	3,126	6,073	47,481	32,072	142,703
Madagascar	291,022	226,091	439,287	63,556	42,930	191,017
Malawi	206,061	95,068	184,714	177,771	120,079	534,285
Mali	184,077	164,765	320,132	102,097	68,963	306,850
Mauritania	25,418	48,617	94,462	5,768	3,896	17,336
Mauritius	45,527	34,992	67,989	0	0	0
Mozambique	293,615	208,510	405,126	82,867	55,974	249,055
Namibia	57,682	49,501	96,178	3,725	2,516	11,196
Niger	344,528	182,442	354,478	102,882	69,494	309,209
Nigeria	335,337	534,973	1,039,431	1,481,399	1,000,638	4,452,292
Rwanda	207,221	139,144	270,352	84,071	56,787	252,673
Senegal	367,827	308,780	599,948	13,784	9,311	41,428
Sierra Leone	42,918	39,883	77,492	39,003	26,345	117,221
Somalia	80,825	73,711	143,217	11,160	7,538	33,541
South Africa	1,655,672	1,332,710	2,589,405	27,748	18,743	83,396
South Sudan	62,793	28,823	56,002	102,863	69,480	309,150
Sudan	539,231	405,039	786,975	147,809	99,840	444,234
Swaziland	30,264	18,750	36,431	2,333	1,576	7,010
Togo	57,556	52,974	102,927	14,667	9,907	44,080
Uganda	501,226	231,850	450,476	131,451	88,791	395,072
Tanzania	539,362	375,036	728,681	464,403	313,689	1,395,745
Zambia	156,544	146,673	284,981	78,517	53,036	235,980
Zimbabwe	164,135	117,179	227,674	116,894	78,958	351,321
TOTAL	**10,931,456**	8,458,782	16,435,090	**5,106,290**	3,449,137	15,346,773

Table S7: Training costs for 23* MfSW institutions

Institution	Training costs (USD)**	Number of microbial tests per year	Ongoing training costs per test (USD)***	Population served	Training costs per person served (USD)
E1	1,568	180	4.4	130,000	0.01
E2	1,168	612	1.0	410,000	0.00
E3	16,326	852	9.6	10,560,058	0.00
E4	5,361	2,220	1.2	20,000,000	0.00
G1	9,965	2,448	2.0	686,221	0.01
K1	368	984	0.2	400,000	0.00
K2	178	300	0.3	261,438	0.00
K3	2,185	344	3.2	90,000	0.02
K4	3,640	2,880	0.6	174,450	0.02
K5	1,260	312	2.0	25,564	0.05
K6	9,796	1,032	4.7	261,876	0.04
K7	6,855	4,000	0.9	527,290	0.01
S1	24,071	2,664	4.5	4,985,467	0.00
U1	5,751	1,224	2.3	570,705	0.01
U2	2,681	1,752	0.8	776,000	0.00
U3	3,298	936	1.8	239,878	0.01
U4	5,976	2,280	1.3	478,192	0.01
U6	3,633	1,008	1.8	43,459	0.08
Z1	2,958	636	2.3	94,714	0.03
Z2	1,865	360	2.6	75,343	0.02
Z3	7,424	1,500	2.5	2,011,957	0.00
Z4	9,823	1,020	4.8	87,717	0.11
Z6	8,177	1,061	3.9	470,000	0.02
Average	**5,840**		**2.5**		**0.02**
St. dev.	**5,587**		**2.1**		**0.03**

* This includes the institutions that provided data on testing costs (Table S1) in addition to several other MfSW partner institutions.

** Using currency exchange rates of 1/1/2015.

*** Assuming that the training is reiterated every 2 years

Supporting figures

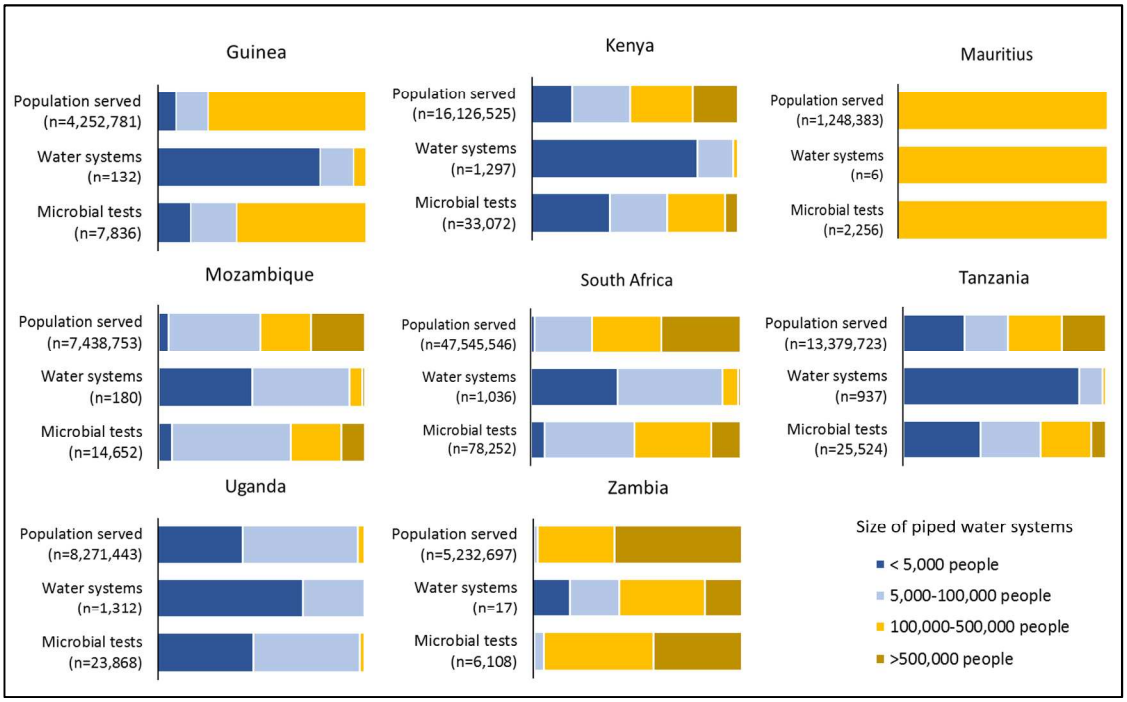

Figure S1: Estimated population served with piped water, number of water systems, and number of annual microbial water quality tests (based on WHO guidelines) per utility size in Guinea, Kenya, Mauritius, Mozambique, South Africa, Tanzania, Uganda, and Zambia. Data sources and detailed derivations for the number of utilities are presented in Tables 1-2 and in Text S2, respectively.

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